AN OUNCE OF PREVENTION

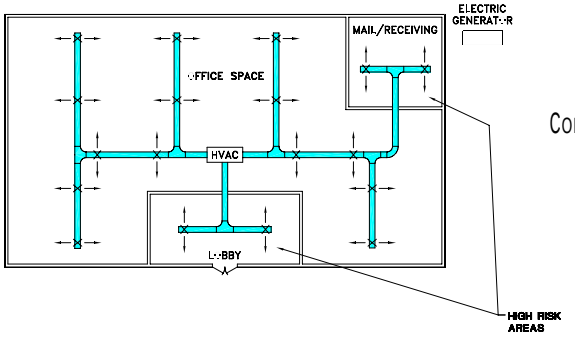
Steps You Can Take to Minimize the Risk or Impact of Chemical/Biological Attacks at Your Facility

In the wake of the September 11th terrorism and subsequent anthrax attacks, many commercial building managers and facility operations executives are addressing completely new areas of concern by carefully scrutinizing the security of their facilities. While the likelihood of attack is apparently low and the level of vulnerability varies considerably, it's nonetheless true that this issue is a "top-of-mind" topic of discussion for many in our field.

Unfortunately, as we have tragically seen, some forms of attacks on buildings are virtually indefensible. However, some attacks through chemical and biological agents, even the effects of explosions, can be prevented or minimized through careful analysis and planning. It's important to understand clearly, right up-front, that no "silver bullet" exists to provide complete protection. However, there are several steps that you can take, ranging from the simple and pragmatic to the more elaborate and expensive, that prevent or mitigate the impact of these types of terrorist attacks.

THE MOST VULNERABLE: HVAC

Clearly, a building's heating, ventilation, and air conditioning (HVAC) system and outdoor air system intakes are likely points-of-entry for a chemical/biological attack, if only because these systems are often accessible to the general public. An airborne chemical/biological attack would simply require a few minutes' access to a ground-level air duct or return-air system for diffusion within the building. With an average intake of 15-20 cubic feet per minute (CFM) of fresh air per person, the HVAC system and supply/distribution ducts throughout the building can rapidly spread deadly biological agents (anthrax, smallpox, or cholera, for example) or chemical agents (such as sarin or hydrogen cyanide).



COMMON HVAC SYSTEM

Most buildings have detection systems for contaminants such as smoke, carbon monoxide, or carbon dioxide, which are unlikely to be deployed in a hostile manner. Further, these contaminants present a minor risk if evacuation plans and life-safety systems are in place. However, no technology currently exists for real-time detection of all chemical and biological agents so that warning signs may occur much later, after people have been contaminated. As a result of these realities, your efforts need to focus on proactive, preventative measures to reduce risk. These can range from simple steps that you can implement quickly and cost-effectively without overhauling your building's infrastructure to more elaborate but necessary measures based on your building's attractiveness as a target.

Assess Your Situation

As you begin to assess your current situation, it's important to consider several interrelated factors. If you are in the design phase for new construction, there are many more cost-effective options available to you. It's far easier and less expensive to design in new security features than to retrofit an existing building, where the adaptability of existing structures is limited and the costs of implementation can be prohibitive.

In the design phase, you can optimally locate HVAC and air intakes to less accessible, more secure areas such as the roof. You can isolate high-risk areas from common ventilation systems and provide full-height partitions to isolate ceiling plenums. You can also design exhaust fans to create a slight negative pressure in high-risk areas to minimize the spread of airborne contaminates.

If you're protecting an existing building, your risk-mitigation plans will depend on several additional factors such as the current as-built conditions of your existing systems. What type of ventilation system is in use at your facility and what type of filtration do you use? What is the "tightness" of your building shell and ductwork? Are all systems functioning properly?

Regardless of whether your building is to be constructed or existing, you should carefully assess your building's risk-to-value ratio as a potential target. That means weighing your location, building population, symbolism, and occupant status. If your building is a shipping or mail facility, its risk also rises.

Is Your Building at Risk?

- A Self-Assessment

- Are you located near/in a major metropolitan area? Are you near "high-profile" buildings? Are you located near another building that is high-risk?
- Is your building occupied by a large number of people?
- Is your building a shipping/mailing facility?
- Is your building seen as a major symbol of government or capitalism? Are your occupants involved in governmental functions or major high-profile business activities?

The results of this up-front analysis have a direct bearing on what cost thresholds you can justify for any design decisions or building remediation efforts.

Increase Internal Security

Safety starts with vigilance and paying attention to the basics. The "little things" that are simple and cost-effective measures count for a lot. Secure your building perimeter (including security fencing around ground-level air intakes), issue badges for building access to all occupants, and mandate escorts for visitors and service technicians. Consider tighter controls for access to mailrooms, shipping, and receiving areas.

Be sure to keep doors to mechanical, electrical, and fire pump rooms and rooftop access locked at all times and deploy alarms for critical areas, such as access to air-handling units and vulnerable ductwork. Key-card access systems are ideal for these special areas because they enable you to maintain an audit log of who has entered what rooms, spaces, and zones. With carefully recorded history, you can even analyze patterns to detect unusual traffic or behavior. If you haven't already done so, consider installing a video monitoring system or motion detection or for even greater security at outside air-intake louvers or other sensitive areas.

Perform Routine Tests of Life Safety Systems

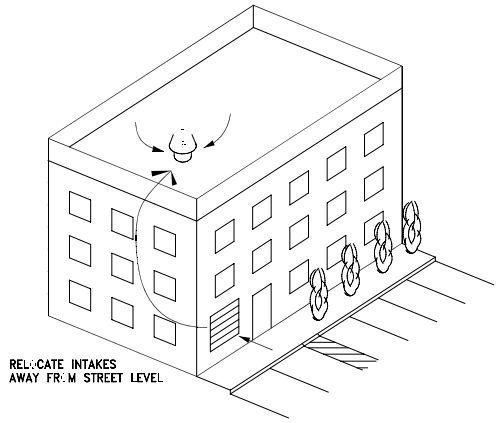
Another cost-effective step is to regularly test your building's life-safety systems. What were once the mundane processes of testing basic emergency systems have now become essential anti-terrorism practices because these systems will be of critical importance during any explosion or biological/ chemical attack. Test your fire alarm and fire pump frequently. Test your emergency power and exit lighting systems more frequently - perhaps monthly - to ensure they are functioning properly. Are your communication systems (including public address speakers) working? Exercise your fan systems for stairwell pressurization and check stairwell seals/door sweeps. Re-evaluate your evacuation plans and be sure to communicate them to occupants (a planned drill is probably a good idea).

Risk Reducing Checklist

- Secure the building perimeter
- Issue badges for building access
- Provide escorts for visitors and service technicians
- Control access to mail room and shipping/ receiving
- Lock mechanical, electrical, fire pump rooms, roof access
- Alarm mechanical rooms and other critical areas
- Alarm access doors to air handling unit equipment, vulnerable ductwork
- Install motion detectors, surveillance cameras
- Install security fencing around ground-level intakes and emergency generators

Relocate Air Intakes

Built in a more secure era, many buildings' air intake grates are located at or near ground level, such as in below-grade sidewalk wells. This location makes terrorist access far too easy. If practical, consider relocating the intake to upper levels of your building or even the roof. This considerably restricts any unauthorized access to your air intake. While this is far more feasible (and cost-effective) to achieve during the design cycle of a new building than to retrofit an existing building, your situation and risk factors may make it a necessary proposition for even an older building.



HVAC Design Strategies
Relocate ground-level outdoor air intakes to higher elevations

A major insurance company with a four-building campus needed options for protecting its grade-level air intakes. Relocation of these intakes was not economically feasible. Vanderweil Engineers proposed a variety of measures, including physical barriers (such as landscape and hardscape), motion detection, ultraviolet lamps, and gas-phase filtration. Security detection measures would trigger the closing of the outdoor air intakes and shutdown of appropriate air-handling systems.

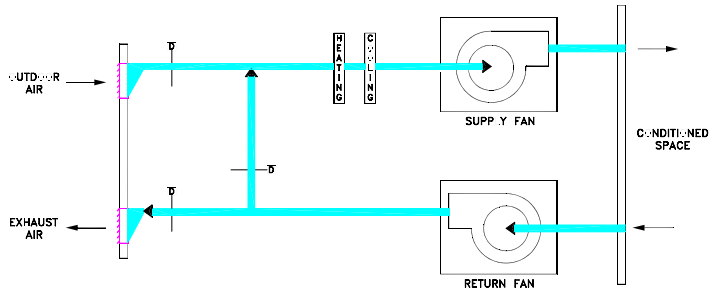
Another example was a pharmaceutical firm with a research campus consisting of labs, vivarium, and office space with an unfenced perimeter. While awaiting construction of its site-boundary fence, they asked Vanderweil Engineers to evaluate temporary measures to protect its ground-level HVAC intakes. Our recommendations included security cameras, temporary barriers around the intakes, motion detectors, and increased security guards.

Upgrade Your Air Filtration

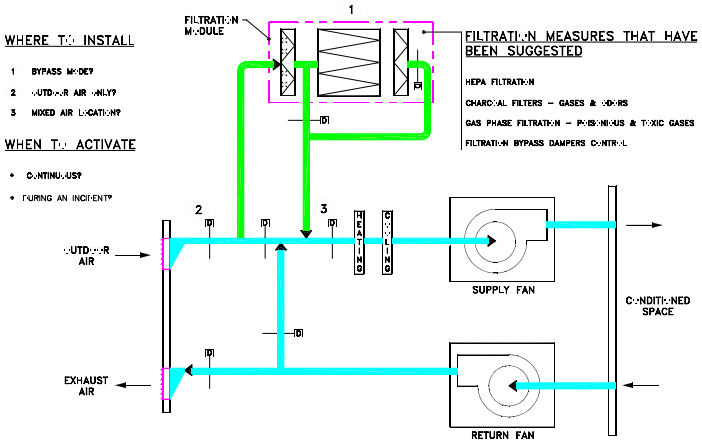
High-efficiency particulate arrestor (HEPA) certified filters can screen out more than 99 percent of bacteria at 0.3 microns or larger in size. If all portions of the air system are covered by a system that continually re-filters the air, your risks are far lower.

However, it's important to understand that there are several drawbacks to HEPA filtration. It's expensive to install and expensive to operate and is ineffective against chemical hazards. HEPA filters increase static pressure, energy, and electrical requirements. Existing systems may not have the space, fan capacity, or power to accommodate HEPA filters and you need to ensure a tight seal to avoid air leakage. Most importantly, you need to know that a contamination event has occurred to properly dispose of a contaminated HEPA filter. Unless properly trained technicians with protective gear are performing the bag-in, bag-out filter change, contaminants will still be a threat to occupants.

Air Handling Unit with Typical Filtration and Economizer Control



Air Handling Unit Modified to Include Optimal Air Filtration and Bypass Dampers with Economizer Control



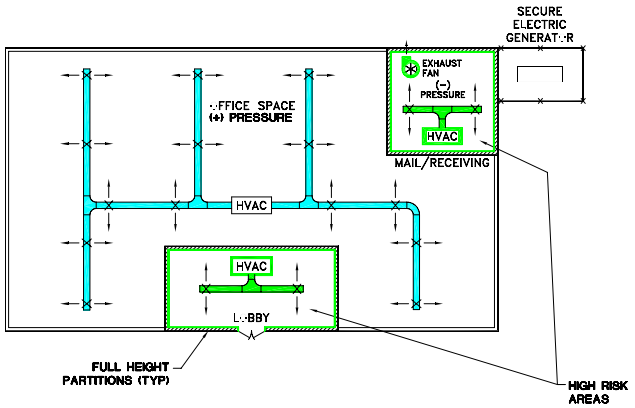
Additionally, some experts believe that deploying electrostatic filters at the start of the air conditioning process can further limit any potential air contamination. These are not as efficient as HEPA filters and require extensive maintenance. EPA and electrostatic filtration will likely not be the right solution for many buildings. However, a careful cost-benefit analysis may indicate its appropriateness for certain higher risk buildings and situations.

Building engineers sometimes turn to gas-phase filtration or ultraviolet (UV) lamps as an additional protective/ preventative measure. Gas-phase filtration is effective at absorbing toxic and poisonous gases, but different toxins require different absorption media (such as activated carbon or potassium permanganate). If you don't have the correct filter for the introduced contaminant, the system will not work effectively. UV lamps are virtually unproven against present threats because the limited UV intensity and exposure time to contaminates in ducted airstreams can be too low to neutralize passing agents.

Deploy Dedicated Systems for Unsecured Areas

Certain areas of your building, such as the lobby, the mailroom, or shipping and receiving areas, are perhaps more vulnerable to chemical/biological contamination. The lobby is the likely target for a quick-strike attack and we've already seen the damaging potential of postal-borne anthrax.

For these reasons, it might be appropriate to install and operate dedicated HVAC systems for these high risk areas. In the event of contamination, exposure would be limited only to those areas served by the dedicated HVAC system. Exhaust fans in these areas can create slight negative pressure as well. This could prevent wider dispersal of toxins throughout an office building.



Independent HVAC Systems for High Risk Areas

For example, Vanderweil Engineers was asked to develop a mechanical design to help protect and isolate the mail room of a major U.S. government department's headquarters from anthrax contamination. Construction is expected to begin soon.

A recent expansion at the Centers for Disease Control (CDC) includes a new laboratory to accommodate portions of the National Center for Infectious Diseases (previously located in other buildings at the CDC Atlanta campus). The building design provides flexible and technologically appropriate microbiological laboratory arrangements to enable the CDC to safely continue its world-class infectious-disease research. This two-phase project, totaling 220,000 square feet, will support the nation's largest bio-safety level BL-3 and BL-3+ barrier/containment facility. As a result of the engineering design services provided by Vanderweil Engineers, the research workers at this facility can conduct their research in a safe environment, knowing that all contaminants will be contained within the state-of-the-art laboratory.

CENTERS FOR DISEASE CONTROL AND PREVENTION, INFECTIOUS DISEASE LABORATORY ATLANTA, GA

FIND THE SAFE HAVENS

Analyze the actual airflow patterns in your building and make sure that you can identify safe-haven areas where occupants can gather if a contamination event occurs. Make sure these areas are clearly marked and arm your staff with procedures and drills to ensure occupants understand their locations. You might also consider stocking equipment in these safe havens

that will enable occupants to test for the presence of toxins, sterilize air or materials, and treat victims with first-aid materials.

Conclusion

Despite the availability of advanced instrumentation and systems, there is no magic formula for complete protection with complex building security challenges. Sophisticated filtration systems cannot provide 100-percent protection in commercial HVAC systems. UV lamps cannot protect against today's threats. Costs for many risk-mitigation solutions are expensive and difficult to incorporate into existing structures. The fact is, the simplest preventive measures, upgraded security and testing of vigilant life-safety systems, can still be the best answers.

Vanderweil Engineers can provide a range of consulting services to help you gain a better understanding of how your building works so that you can take informed proactive, preventative steps to improve building security. These services include education and training, system audits, redesign concepts, collaboration with industrial hygienists, scenario planning, and much more.

For more information, please visit www.vanderweil.com

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